X. EXOGENOUS COSTS NOT INCLUDED IN THE PCI ADJUSTMENT FACTOR SHOULD STILL BE ALLOWED. (Issues 7a and 7b)

Exogenous cost changes should still be permitted under the price cap rules. Price caps are meant to mimic a competitive market where regulation does not require market participants to incur certain costs. Yet, price cap LECs are required to incur costs that would not be incurred if they were operating in a truly competitive market. As long as these costs uniquely affect price cap LECs and are not captured by the PCI adjustment factor, they should receive exogenous treatment.[76]

In the *First Report and Order* (10 FCC Rcd at 9090-9091), the Commission established a third prong to its exogenous cost test, and now requires LECs to show that "their cash flows have changed due to the accounting cost changes." In addition, the Commission (*id.* at 9099) has determined that the issue of exogenous cost treatment must be addressed in a rulemaking proceeding or through a request for a waiver of the rules or a declaratory ruling. This provides the Commission the opportunity to determine if these costs are captured by the PCI adjustment factor. The Commission has made the exogenous test very strict; it should not further limit the ability of price cap LECs to seek such treatment. Until price cap LECs are allowed to operate in a fully competitive market where administrative, legislative, or judicial actions do not uniquely affect them, they should be allowed to seek exogenous treatment for costs incurred as a result of these actions if these costs are not accounted for in the PCI adjustment factor.

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76 Examples of costs that would not have been captured in the past are the amortization of inside wire and the reserve depreciation amortization.

In summary: To the extent that costs are not captured in the PCI adjustment factor, the Commission should rely on its existing rules to determine whether or not they qualify for exogenous treatment.

XI. THE TIMING OF A PERFORMANCE REVIEW IS DEPENDENT ON THE RULES ESTABLISHED BY THE COMMISSION IN THIS PROCEEDING. (Issue 8)

If the Commission adopts its tentative conclusions in the instant proceeding and (i) establishes a properly constructed PCI adjustment factor without sharing that is updated annually, (ii) adopts the pricing flexibility proposals in the *Second Notice,* and (iii) sets in place the criteria for streamlined regulation and nondominant treatment also proposed in the *Second Notice*,[77] the stage will be set for annual PCI adjustment factor updates and for services to be moved out of price caps -- thereby negating the need for frequent reviews. The proceedings required to establish new values for the PCI adjustment factor have been extensive, and costly for both the Commission and the parties.

It is critical that the Commission structure the LEC price cap plan so that frequent reviews are unnecessary. All affected parties, not just price cap LECs, make major business decisions based on the Commission's rules, and frequent changes to these rules make it impossible to make sound business decisions. Moreover, if reviews occur too frequently, the system starts once again to mimic rate of return regulation. For the

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[77] *See Second Notice* at paras. 127-158.

exchange carrier, a review every few years, which takes away earnings above a certain rate of return, would eliminate the incentive to improve productivity -- which is at the heart of the price cap system, at the heart of "incentive" regulation.

In summary: GTE urges the Commission to structure the price cap plan in such a manner that frequent reviews are unnecessary. Not only would this action eliminate unnecessary time and effort by the Commission, the price cap LECs, and other participants, but it would allow all parties affected by the price cap plan to move ahead with decision-making processes that depend on this plan.

Respectfully submitted,

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December 18, 1995

THEIR ATTORNEYS

APPENDIX A

THE APPROPRIATE MEASURE FOR A PCI ADJUSTMENT FACTOR IS THE GROWTH OF LEC INPUT PRICES MINUS THE RATE OF GROWTH OF LEC TFP.

Under competition, a properly weighted index of output price changes equals the difference of a properly weighted index of input price changes minus the rate of change of total factor productivity.

Let $p_j(t)$ indicate output prices at time t, let $q_j(t)$ indicate output levels, let $w_i(t)$ indicate input prices and let $x_i(t)$ be input levels, and let

$$C(t) = C(q_1(t), \cdots, q_I(t), w_1(t), \cdots w_J(t), t)$$

be a cost function depending on outputs, input prices, and time. In competition, there is a zero profit condition that total revenue equals total cost that holds identically; *e.g.*,

$$\sum_{i=1}^{I} p_i(t) q_i(t) \equiv C(q_1(t), \cdots, q_I(t), w_1(t), \cdots w_J(t), t)$$

or

$$R(t)=C(t);$$

differentiating with respect to time gives:

$$\begin{aligned}\sum_{i=1}^{I} p_i(t)\dot{q}_i(t) + \dot{p}_i(t)q_i(t) \equiv & \sum_{i=1}^{I} C_i\big(q_1(t), \cdots, q_I(t), w_1(t), \cdots, w_J(t), t\big)\, \dot{q}_i(t) \\ & + \sum_{j=1}^{J} C_j\big(q_1(t), \cdots, q_I(t), w_1(t), \cdots, w_J(t), t\big)\, \dot{w}_i(t) \\ & + C_t\big(q_1(t), \cdots, q_I(t), w_1(t), \cdots, w_J(t), t\big)\end{aligned}$$

$$R(t)\Sigma_{i=1}^{I}\frac{p_i(t)q_i(t)}{R(t)}\frac{\dot{q}_i(t)}{q_i(t)}+\frac{\dot{p}_i(t)}{p_i(t)}\frac{p_i(t)q_i(t)}{R(t)} \equiv C(t)\Sigma_{i=1}^{I}\frac{C_i\left(q_1(t),\cdots,q_I(t),w_1(t),\cdots,w_J(t),t\right)q_i(t)}{C(t)}\frac{\dot{q}_i(t)}{q_i(t)}$$

$$+C(t)\Sigma_{j=1}^{J}\frac{C_j\left(q_1(t),\cdots,q_I(t),w_1(t),\cdots,w_J(t),t\right)w_j(t)}{C(t)}\frac{\dot{w}_j(t)}{w_j(t)}$$

$$+C(t)\frac{C_t\left(q_1(t),\cdots,q_I(t),w_1(t),\cdots,w_J(t),t\right)}{C(t)}$$

$$\sum_{i=1}^{I}\frac{\dot{p}_i(t)}{p_i(t)}\frac{p_i(t)q_i(t)}{R(t)} \equiv -\sum_{i=1}^{I}\frac{\left(p_i(t)-C_i\left(q_1(t),\cdots,q_I(t),w_1(t),\cdots,w_J(t),t\right)\right)q_i(t)}{R(t)}\frac{\dot{q}_i(t)}{q_i(t)}$$

$$+\frac{C(t)}{R(t)}\sum_{j=1}^{J}\frac{C_j\left(q_1(t),\cdots,q_I(t),w_1(t),\cdots,w_J(t),t\right)w_j(t)}{C(t)}\frac{\dot{w}_i(t)}{w_j(t)}$$

$$+\frac{C(t)}{R(t)}\frac{C_t\left(q_1(t),\cdots,q_I(t),w_1(t),\cdots,w_J(t),t\right)}{C(t)}$$

Under competition,

$p_i(t)=C_i\left(q_1(t),\cdots,q_I(t),w_1(t),\cdots,w_J(t),t\right)$ and *$R(t)$=$C(t)$* so

$$\sum_{i=1}^{I}\rho_i(t)\frac{\dot{p}_i(t)}{p_i(t)} \equiv \sum_{j=1}^{J}\sigma_j\frac{\dot{w}_i(t)}{w_j(t)}+\frac{C_t\left(q_1(t),\cdots,q_I(t),w_1(t),\cdots,w_J(t),t\right)}{C(t)}$$

which can be shown to be

$$\sum_{i=1}^{I}\rho_i(t)\frac{\dot{p}_i(t)}{p_i(t)} \equiv \sum_{j=1}^{J}\sigma_j\frac{\dot{w}_i(t)}{w_j(t)}-\frac{\dot{TFP}}{TFP}$$

To see this, note that if *$F(y,x,t)$* is a distance function representing a technology, then the efficient netput pairs *(y, x)* satisfy *$F(y,x,t)$*=1. Thus $F(y,x,t)\equiv 1$. Totally differentiating gives:

$$\frac{\partial F(y,x,t)}{\partial y}\dot{y}+\frac{\partial F(y,x,t)}{\partial x}\dot{x}+\frac{\partial F(y,x,t)}{\partial t}\equiv 0$$

$$\frac{\partial F(y,x,t)}{\partial t} \equiv -\left(\frac{\partial F(y,x,t)}{\partial y}\dot{y} + \frac{\partial F(y,x,t)}{\partial x}\dot{x}\right)$$

Also, by the envelope theorem, if

$$C(y,w,t) = \min\{x'w \mid F(y,x,t) = 0\}$$

then

$$\frac{\partial C(y,w,t)}{\partial t} = \lambda \frac{\partial F(y,x,t)}{\partial t}$$

Whereas profit maximization implies:

$$p_i = \lambda \frac{\partial F(y,x,t)}{\partial y_j}$$

$$w_j = \lambda \frac{\partial F(y,x,t)}{\partial x_j}$$

$$\begin{aligned}
\frac{\partial C(y,w,t)}{\partial t}\frac{1}{C} &= -\frac{(p'\dot{y} + w'\dot{x})}{C} \\
&= -\frac{R}{C}\sum_{i=1}^{I}\frac{p_i y_i}{R}\frac{\dot{y}_i}{y_i} + \sum_{j=1}^{J}\frac{w_j x_j}{C}\frac{\dot{x}_j}{x_j} \\
&= -\frac{R}{C}\sum_{i=1}^{I}\rho_i\frac{\dot{y}_i}{y_i} + \sum_{j=1}^{J}\sigma_j\frac{\dot{x}_j}{x_j} \\
&= -\frac{\dot{TFP}}{TFP}
\end{aligned}$$

Where $\frac{R}{C} = 1$, on account of the zero profit condition.

APPENDIX B

THE EXISTING PRICE CAP FORMULA IS ONLY ECONOMICALLY VALID IF NO ADJUSTMENT IS MADE FOR THE W-FACTOR.

The *GDPPI-X+/-Z* formula, constructed as an approximation to the economically valid formula proposed by GTE, presupposes that the US input price change index grows at the same rate as the LEC price change index.

When the LEC input price index is unavailable, it may be approximated using the US industry input price index under the assumption that the two indices are the same -- that is $\%\Delta W_{LEC} \cong \%\Delta W_{US}$. Christensen,[1] NERA,[2] and Duncan[3] have presented evidence that indeed the two series are the same.

Lacking a specific US industry input price change index, this also can be approximated by solving:

$$\%\Delta P_{US}=\%\Delta W_{US}-\%\Delta TFP_{US}{}^{4}$$

to obtain:

$$\%\Delta W_{US}=\%\Delta P_{US}+\%\Delta TFP_{US}$$

Substituting this for the LEC input price change index gives the formula:

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1 *See Ex Parte* Affidavit of Dr. Laurits R. Christensen on Behalf of the United States Telephone Association, CC Docket No. 94-1, dated February 1, 1995.

2 *See* USTA's Comments in the instant proceeding, Attachment C.

3 *See Duncan,* Testimony, pp. 5-10.

4 This is the theoretical relationship between the economy-wide price index, usually measured by changes in GDPPI, a hypothetical economy-wide input price change index, and the economy-wide TFP, published by the BLS.

$$
\begin{aligned}
\%\Delta P_{LEC} &= \%\Delta W_{LEC} - \%\Delta TFP_{LEC} \\
&= [\%\Delta P_{US} + \%\Delta TFP_{US}] - \%\Delta TFP_{LEC} \\
&= \%\Delta P_{US} - [\%\Delta TFP_{LEC} - \%\Delta TFP_{US}] \\
&= \%\Delta P_{US} - X
\end{aligned}
$$

Finally, $\%\Delta GDPPI$ is used to approximate $\%\Delta P_{US}$. The Z-Factor arises from consideration of other exogenous factors which, under competition, would cause output price changes and is simply added or subtracted as dictated by theory.

APPENDIX C

PROPERLY DONE, INCORPORATING A W-FACTOR REVERTS TO GTE's PROPOSED METHOD, BUT WITH UNNECESSARY COMPLICATIONS THAT ALLOW THE POSSIBILITY OF GAMING.

In this appendix, GTE shows that, properly done, the *GDPPI-X+W+/-Z* formula reverts to the method proposed by GTE -- provided the averaging or prediction is done in a consistent fashion. If not done consistently; *i.e.*, if LEC TFP and input price series are measured using different methods than those employed for US TFP and input price series, the results will not be the same. Thus, employing a W-Factor to correct for possible differences in the US and the LEC input price series introduces a needless complication that may be manipulated to game the process. As discussed *supra*, when the LEC input price index is unavailable, it may be approximated using the US industry input price index to give the *GDPPI-X+/-Z* formula, under the assumption that the two indices are the same -- that is $\%\Delta W_{LEC} \cong \%\Delta W_{US}$. When they are not the same, a different derivation should be used. Assume here that:

$$\%\Delta W_{LEC} \cong \%\Delta W_{US} + W.$$

Using the same argument as in Appendix B,

$$\%\Delta W_{US} = \%\Delta P_{US} + \%\Delta TFP_{US}.$$

Substituting this for the LEC input price change index gives the formula:

$$
\begin{aligned}
\%\Delta P_{LEC} &= \%\Delta W_{LEC} - \%\Delta TFP_{LEC} \\
&= [\%\Delta GDPPI + \%\Delta TFP_{US} + W] - \%\Delta TFP_{LEC} \\
&= \%\Delta GDPPI - [\%\Delta TFP_{LEC} - \%\Delta TFP_{US}] + W \\
&= \%\Delta GDPPI - X + W
\end{aligned}
$$

Where again, $\%\Delta GDPPI$ is used to approximate $\%\Delta P_{US}$. A Z-Factor arising from consideration of other exogenous factors, which under competition would cause output price changes, is simply added or subtracted as dictated by theory and is not of concern here. Note that the first line in the formula is exactly what GTE proposes, whereas the last one is the proposed Commission formula with a W-Factor added.

Provided each component is calculated as required by theory, the two approaches should be the same. Consequently, the more complicated of the two should not used. Further, in order to apply the model, the Commission must obtain estimates for each component in the formula. The formula based on an input price differential requires estimates of $\%\Delta P_{US}$ and $\%\Delta TFP_{US}$, for which the Commission uses GDPPI and a TFP estimate produced by the BLS. However, to the extent that the inputs in the model are not estimated in a consistent manner, the PCI adjustment derived will be biased. The direct method eliminates the need to estimate these components, and hence this source of error.

However, it must be noted that for the two methods to yield the same result, all of the terms in the formulas must be forecast in the same manner. What must be avoided at all costs is a piecemeal forecasting of the parts of the formula. For example, if the GDPPI is not averaged, the X-Factor is subject to a five-year moving average, while the

W-Factor is subject to a seven or ten-year moving average, then the methods will not yield identical results. Worries about the possibility of gaming the averaging process lead GTE to endorse the simplest method, while standing ready to support *GDPPI-X+/-Z* if that proves easier to calculate and is more stable.

On the issues of gaming the averaging and stability, forecasting the PCI adjustment factor on the basis of past PCI adjustments, using optimal time-series' methods, removes the averaging process from gaming. Statistical tests exist to determine if the PCI is being optimally forecast or not. Indeed, such forecasts automatically remove the random component from the PCI that would cause instability; that is, they automatically smooth. Moreover, once the data are compiled and a new PCI adjustment is calculated from actual data, the forecast can be automatically updated. Such updates can be done quickly on modern personal computers. These latter three points apply to all three of the formulas.

APPENDIX D

ARIMA FORECASTS PROVIDE THE BEST WAY OF DETERMINING A PCI ADJUSTMENT FACTOR ON A GOING-FORWARD BASIS THAT IS CONSISTENT WITH MIMICKING COMPETITION.

In this section, GTE will briefly outline an ARIMA forecasting method which could be used to predict the PCI on a going forward basis -- the one-year ahead forecast based on the most up-to-date data set being used as the PCI adjustment factor.

Let

$$y_t \quad t=0,\cdots,T\text{-}1$$

be an observed series of PCI adjustments. These are not the ones predicted by the Commission and imposed as the PCI adjustment factor. Rather, these are the PCI adjustments actually observed as calculated using the LEC direct method based on industry data. These data are analyzed using ARIMA time series methods. That is, the data are investigated to see if there are trends or unit roots. If so, the data are differenced up to the degree of integration. It is unlikely that the PCI series will exhibit unit roots, so GTE will treat only the more standard stationary case. GTE postulates that:

$$y_t - m = \sum_{i=1}^{p} a_i \left(y_{t-i} - m\right) + \sum_{j=0}^{q} q_j e_{t-j}$$

where the ε are white noise errors, p and q are values determined in the identification phase by examining the direct, inverse, and partial autocorrelation functions, and the μ, α and θ are unknown parameters whose values are to be determined in the estimation phase. This assumption is based on the fact that most time series can be represented this way. Those that cannot are rare and easily fixed. All the estimation, identification and forecasting can be performed quickly on a personal computer using off-the-shelf statistical software such as SAS Institute's PROC ARIMA.

Once the μ, α and θ are estimated, the forecast is made using the p most recent values of the y's and the q most recent values of the ε which are fit as part of the forecasting process. This is performed automatically by any good forecasting software, such as the SAS Institute's mentioned above.

For the PCI, the Commission has two choices. The first is to use the one-period ahead forecasts as discussed. The second would be to ignore any short term variation and to use the long-run equilibrium value of the PCI process. The long-run equilibrium value of this growth is simply μ.

Presumably, these calculations, as well as the forecasts, would be performed by qualified outside analysts. However, the LECs, as well as the Commission staff, can easily do the calculations themselves to aid in longer term decision making; *e.g.*, forecast for more than one year if need be. The first year forecast should be used as the PCI adjustment factor, and subsequent years as estimates for planning purposes.

GTE's analysis, which is based on the data exhibited in Appendix F of the *First Report and Order*, is contained in Appendix E. This analysis suggests that the PCI is an AR(1) process with long-run equilibrium growth of 1.9, and a coefficient of 0.48.

APPENDIX E

GTE's ANALYSIS OF THE DIRECT METHOD

Below is the code written in SAS 6.10 for Windows that was used in GTE's analysis.

```
data newdat;
set c.fccdat;                * data from Appendix F of the First Report and Order;
pci_gte=lecip-lectfp;        * calculate the pci adjustment factor using the icc method;
run;
proc print;
run;
proc arima;
identify var=pci_gte;        * determine what type of series pci_gte is;
                             * the next step is usually run after analyzing the;
                             * results of the identification procedure;
                             * here we use the fact that the series was;
                             * already identified.  And use the results;
estimate p=1 q=0;            * estimate the process after it has been identified;
forecast lead=1;             * forecast the next year after the end of the series;
run;
```

The following pages contain the output from the code. Annotations in italics were added by GTE for explanation. The graphs were reworked from printed output for readability. Some extraneous spacing and redundant tables were deleted.

OBS	YEAR	USIP	LECIP	LECTFP	USTFP	GDPPI	PCI_GTE
1	1949	-1	3.2	-1.1	0.3	0	4.3
2	1950	6.3	5.1	4.5	4.4	0	0.6
3	1951	7.9	8.8	4.8	2.4	0	4
4	1952	1.2	8.8	2.3	0.1	0	6.5
5	1953	3.7	2.4	0.9	0.2	0	1.5
6	1954	0.6	1.9	0.8	-0.8	0	1.1
7	1955	6.6	5.4	5.2	4.4	0	0.2
8	1956	0.7	1.7	1.4	-1.4	0	0.3
9	1957	3.7	-1.1	5.2	0.3	0	-6.3
10	1958	0.5	3.3	1.6	-0.6	0	1.7
11	1959	7	5.4	5.8	4.2	0	-0.4
12	1960	-0.6	4.2	3.9	-1.6	1.44	0.3
13	1961	3.6	3.9	2.2	2.9	1.06	1.7
14	1962	4.4	2.2	3	2.3	1.4	-0.8
15	1963	3.8	1	2.3	2.7	1.38	-1.3
16	1964	4.5	6	3.1	3.2	1.37	2.9
17	1965	5.7	0.5	2.9	3.1	1.68	-2.4
18	1966	4.6	1.1	4.3	1.8	2.98	-3.2
19	1967	2	1.9	3.3	-0.2	3.22	-1.4
20	1968	4.4	4.2	4.4	0.7	4.36	-0.2
21	1969	3.7	2.1	3.8	-0.8	4.78	-1.7
22	1970	3.3	3.8	0.6	-0.9	5.13	3.2
23	1971	6.8	4.2	1.1	2.2	5.15	3.1
24	1972	7.2	8	4	2.9	4.38	4
25	1973	6.3	0.6	4.3	0.9	5.43	-3.7
26	1974	4.2	5.9	3.7	-3.5	8.9	2.2
27	1975	9.4	14.2	2.8	0.1	9.46	11.4
28	1976	9.1	10.7	4.4	2.7	5.7	6.3
29	1977	8.6	6.1	3.6	2	6.51	2.5
30	1978	7.8	7.6	4.8	0.8	7.33	2.8
31	1979	8.2	7.2	4.2	-0.1	8.46	3
32	1980	6.6	14.6	5.1	-1.6	9	9.5
33	1981	9.9	11.6	0.5	0.9	9.22	11.1
34	1982	3.7	12.1	1	-3	6.3	11.1
35	1983	5.6	12.8	4.3	2	4.15	8.5
36	1984	7.4	1.8	-2.2	3.5	3.64	4
37	1985	4	0.1	1.1	0.5	3.51	-1
38	1986	3.8	1.3	2.8	1	2.86	-1.5
39	1987	3.1	1.7	1.8	0.2	3.09	-0.1
40	1988	4.4	-3.2	2.1	0.5	4	-5.3
41	1989	4.1	-3.7	2	-0.2	4.42	-5.7
42	1990	4.2	11.9	4.6	-0.3	4.6	7.3
43	1991	2.9	1.3	1.2	-1	3.96	0.1
44	1992	5.1	4.4	3.5	1.5	3.22	0.9

ARIMA Procedure

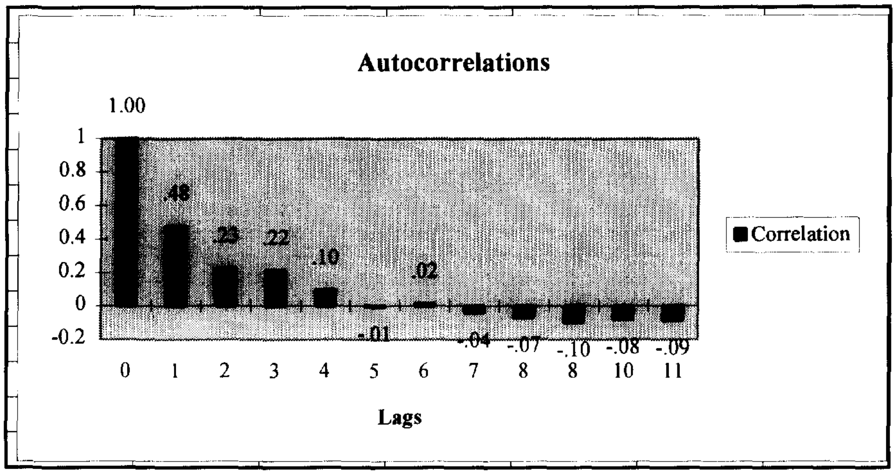
Name of variable = PCI_GTE.

Mean of working series = 1.843182

Standard deviation = 4.260143

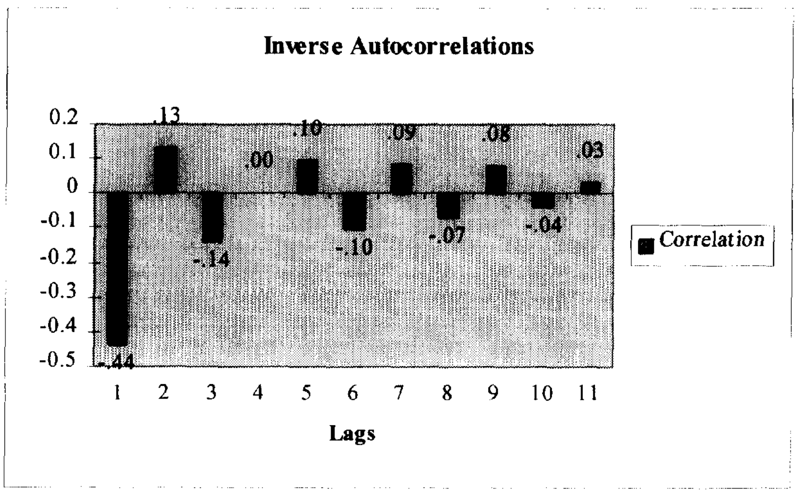
Number of observations = 44

Autocorrelations



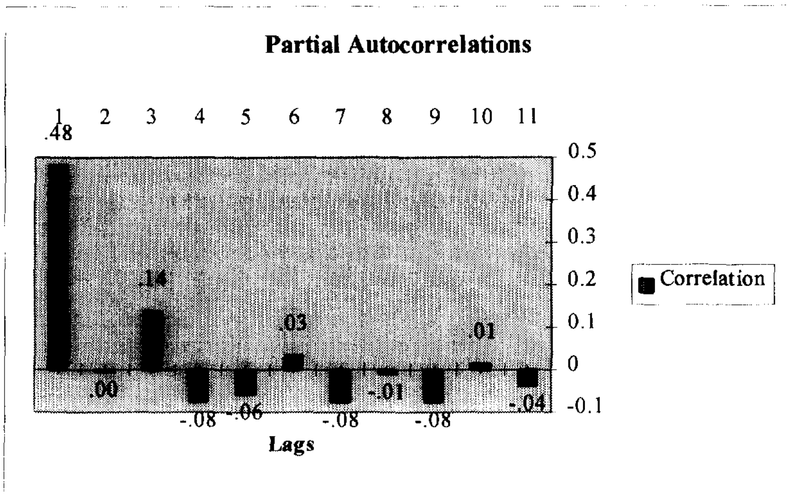
Autocorrelations show an exponentially damped pattern suggesting an AR process.

Inverse Autocorrelations



Inverse auto correlations show a spike at 1 lag indicating an AR(1).

Partial Autocorrelations



Partial Autocorrelations show the same pattern as Inverse Autocorrelations; this also suggests an AR(1).

ARIMA Procedure

Autocorrelation Check for White Noise

To Chi Autocorrelations

Lag Square DF Prob

6 16.13 6 0.013 0.480 0.227 0.216 0.097 -0.007 0.015

Autocorrelation test shows a strong time series component.

The SAS System 4

11:09 Friday, December 8, 1995

ARIMA Procedure

Estimate an AR(1) based on the identification phase above.

Conditional Least Squares Estimation

Parameter	Estimate	Std Error	T Ratio	Lag
MU	1.91819	1.07725	1.78	0
AR1,1	0.48092	0.13541	3.55	1

Estimates of the AR process MU is the long-run AR1,1 is the coefficient on the lag.

Constant Estimate = 0.99569355

This is the estimate of the constant or intercept, not the long-run value.

Variance Estimate = 14.6258152

Std Error Estimate = 3.82437121

AIC = 244.862388*

SBC = 248.430767*

Number of Residuals= 44

* Does not include log determinant.

Correlations of the Estimates

Parameter	MU	AR1,1
MU	1	0.012
AR1,1	0.012	1

Autocorrelation Check of Residuals

To Chi Autocorrelations

Lag Square DF Prob

			Autocorrelations						
	Chi-Sq	df	Prob	1	2	3	4	5	6
6	1.65	5	0.895	0.001	-0.068	0.136	0.028	-0.076	0.056
12	2.56	11	0.995	-0.033	-0.022	-0.064	-0.014	-0.041	0.086
18	10.93	17	0.860	-0.220	-0.166	0.016	0.023	-0.186	-0.093
24	14.65	23	0.907	0.010	0.086	-0.123	0.019	0.111	-0.073

Autocorrelations show elimination of strong time series components in residuals.

Analysis is done

Ready to forecast

Model for variable PCI_GTE

Estimated Mean = 1.91819461

Autoregressive Factors

Factor 1: 1 - 0.48092 B**(1)

The SAS System 5

11:09 Friday, December 8, 1995

ARIMA Procedure

Forecasts for variable PCI_GTE

Obs	Forecast	Std Error	Lower 95%	Upper 95%
45	1.4285	3.8244	-6.0671	8.9242

Forecast of the PCI adjustment for 1993 based on data is 1.4285.

APPENDIX F

GTE CALIFORNIA INCORPORATED TESTIMONY AND REPLY TESTIMONY OF DR. GREGORY M. DUNCAN

Case No.: I.95-05-047
Exhibit:
Witness: Gregory M. Duncan
Date:

GTE CALIFORNIA INCORPORATED

TESTIMONY OF DR. GREGORY M. DUNCAN

Q. Please state your name and your business address.

A. My name is Gregory M. Duncan. My business address is 40 Sylvan Road, Waltham, Massachusetts 02154.

Q. By whom are you employed and in what capacity?

A. I am employed by GTE Laboratories, Inc. ("GTE Labs") and work within its Department of Economics and Statistics. I am a Staff Scientist with responsibility for developing, proposing and conducting research, as well as supervising the research of the other economists and statisticians at GTE Labs.

Q. What is GTE Labs?

A. GTE Labs is the central research and development facility for GTE. Its mission is to provide technical leadership to GTE business units, including GTE California, by conducting research and development activities in areas which will enable the various GTE business units to understand and utilize new advancements in technology. This service involves providing the management of the GTE business units with appraisals of technical trends, systems analyses, and economic assessments to insure the incorporation of technical and economic awareness in the management planning and decision process.

GTE Labs maintains academic ties with many prestigious universities to ensure that GTE stays on the cutting edge of technology. Indeed, of GTE Labs' staff of

600, approximately 500 have Ph.Ds and many hold or have held teaching positions at Harvard, Massachusetts Institute of Technology (MIT) and Boston University. I myself have taught on the faculty of Boston University.

Q. Please describe your educational background and work experience.

A. I received a M.A. in Statistics in 1974 and a Ph.D in Economics in 1976 from the University of California, Berkeley. Beginning in 1975, I taught in the Economics Department and Statistics Program at Northwestern University in Evanston, Illinois, where I was an Assistant Professor of Economics and Statistics. My teaching responsibilities included Demand and Production Theory, Econometrics and Statistics, and graduate level Time Series and Discrete Choice Analysis courses. I also conducted research on demand and production, as well as in time series and discrete choice analysis, which appeared in refereed journals. I left Northwestern in 1979 to join the faculty at Washington State University, where I served as a Professor of Economics and of Statistics. My research continued in demand theory, production analysis, time series, discrete choice analysis and applications, as well as in other topics. During that period, I was one of the first Associate Editors of the academic journal Econometric Theory. Since that time, I have published many refereed papers in demand analysis, production analysis, and consumer and firm behavior.

I joined GTE Labs in 1987. I currently do a great deal of internal consulting within GTE Corporation, which has exposed me to all facets of the telecommunications industry, including specifically, forecasting and demand analysis. I have worked closely with the Demand and Forecasting group within GTE Telephone Operations over the last seven years on a variety of demand analysis issues ranging from developing a forecasting system using state-of-the-art time series procedures to assisting in developing robust regression procedures.

Q. Have you testified before this Commission in the past?

A. Yes. I testified for GTE California Incorporated (GTEC) in Case No. I.87-11-033, Phase III Implementation Rate Design (IRD).

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to recommend a productivity offset factor for use in the price cap mechanism in the event that the Commission chooses to retain the "x" factor as part of the price cap mechanism.

Q. Are you aware of studies which address computation of an appropriate productivity factor for the telecommunications industry?

A. Yes.

Q. At this time, do you recommend any particular study and in its findings regarding appropriate productivity factors?

A. Yes. My recommendation is to adopt the productivity